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Evaluation of Poultry Feed Quality in Khartoum State, Sudan

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Abstract

This study was carried out to assess the quality of poultry feeds sold for poultry farmers compared to National Research Council (NRC, 1994) and Sudanese Standards and Metrological Organization (SSMO, 2015) standards. Chemical analysis using AOAC (1990) was used to assess the quality of 17 samples of poultry feeds (6 broiler starter , 6 broiler finisher and 5 samples layer feed) collected randomly from six factories (A, B, C, D, E and F) during 2013. Dry matter (DM %), crude protein [CP%], ether extract (EE %), crude fiber (CF %), ash% and aflatoxin (ppb) were recorded. Metabolizable energy (ME) was calculated by the equation of Lodhi (1976).Major minerals Ca%, Zn%, K% and Na% and oligo elements Fe mg/kg, Mn mg/kg and Mn mg/kg were determined. The analytical results revealed that in most broiler starter feeds CP content fall within the acceptable level (23%) except feed E showed lower CP percent (18.3%).The CP of broiler finisher feeds were of 20% feed A to 23.16% feed B. For broiler starter feed the metabolizable energy (ME) content ranges from 2914 Kcal/Kg feed E to 3282 Kcal/Kg feed F and the finisher feeds range from 2747 Kcal/Kg feed E to 3349 Kcal/Kg feed A. Most of feeds had a satisfactory levels of ME except feed E which contained a little bit low ME .The mean CF content of all feeds varied from 3.5% to 5.5% whereas the maximum recommended level is ≤ 5 %.DM contents were within the acceptable ranges of (NRC,1994 and SSMO,2015).In both broiler starter and finisher feeds, feed A, D, and F had slightly higher fat content (6.6 - 7.5 %) in contrast feed B, C and E had lower fat content compared to the required levels. Low levels of ash 2.62 – 7.05% than the required level (8 %) were recorded in all broiler starter and finisher feeds except broiler starter feed E showed higher level of ash (14.6 %) than the recommendation. Higher Aflatoxin (ppb) were recorded in broiler starter feeds A, C and D (49.15, 35.63, 35.31 ppb) and broiler finisher feeds B and C (27.22 and 43.59 ppb) compared to the permitted level (≤20 ppb). For all layer feeds the average CP content range between 17.86% to 18.6.% except feed D contained higher CP (20.98%) while the recommendations are around (17 -18%).Meanwhile, ME ranges from 2679.2 Kcal/Kg to 3127.9Kcal/Kg the recommendations being situated around 2749 Kcal/Kg to 2900 Kcal/Kg. Fat and DM contents fall within the acceptable ranges (2-5% fat) and (90 – 95% DM) .On the other hand, all feeds are generally high in ash content (10.33 – 20.85%) compared to the recommended level (8%).All feeds had acceptable ranges of CF (3.5 - 4.5%) and aflatoxin (7.6

- 18.3 ppb). For broiler starter feeds Fe, Mg and Na content were too low compared to the required levels(80 mg/kg, 600mg/kg and 0.2 % respectively),mean while K, Mn and Zn showed higher values except feed B and C showed lower Zn content (21.3 and 33.63%).Ca content ranges between 0.83 to 0.88% which is almost within the required levels (0.9 to 1%) except feed E contained very high level of Ca (3.4%).On the other hand, higher levels of K, Na, Mn and Zn were recorded in all broiler finisher feeds except feed B and C recorded lower values of Zn (0.22 and 0.49 %).Low levels of Fe and Mg were noticed in all feeds except feed F contained the recommended level of Fe (80.03mg/kg).Ca contents in all feeds are generally satisfactory(0.83 to 0.91%0) except feed D and E contained very low levels of Ca (0.24 and 0.49%). Generally in all layer feeds Ca, Fe, Mg, Mn and Na contents were lower than the recommended levels except feed D and E showed higher levels of Fe (62.4 and 69.1mg/kg).On the contrary K (0.49 – 0.55%) and Zn (55.26 - 92.45%) contents were higher. Council (NRC) and (SSMO). On the other hand, minerals content showed significant ($P<0.05$) differences among dietary treatments and most of them were not met the values reported by (NRC) and (SSMO). It could be concluded that the variations observed among different poultry feeds compared to (NRC1994) and (SSMO 2015) specifications strongly indicates that confirmatory analyses should be conducted at regular intervals to control feed quality.

Keywords: Quality-feed analysis-animal production -specification-standards

Introduction

Rapid technological progress in poultry sector has resulted in a remarkable reduction in the cost of production and marketing of poultry products. Falling retail prices of poultry products relative to the cost of other animal products due to this improved technology has resulted in increased consumption of poultry products world wide (Vocke, 1991). Poultry population of the Sudan was estimated to be (47.194.000) head of poultry all over the country. In Khartoum State the area of the study is said to be (13.403.096) head of poultry (Ministry of Agriculture ,Animal Resources and Irrigation, 2015) (M.A.A.R.I).Also the actual poultry meat production was found to be (50.000.000 Kg) and egg production were estimated to be (40.000.000) egg tray. Egg and poultry meat per capita in Sudan were 9.3 kg and 17.8 kg/year respectively (M.A.A.R.I., 2017). The poultry stock is commonly fed on diets with high nutrients density to suit its simple and limited digestive system. These nutrients must be supplied in optimum proportions that promote their efficient utilization for the various body processes of maintenance and production. Poultry sector suffered from several problems including the deficiency of nutritional levels which lead to decreased production. It is very important to study the actual nutritional needs of poultry sector in Sudan due to its reasonable share in the national economic ,but it still need attention to develop the structure and components of poultry feed to meet the specification outlined by (SSMO,2015).Improvement of poultry feed quality depends on developing poultry feed industry in order to increase the efficiency of nutrients utilization of the feed ingredients. The quality of poultry feeds is based on the quality of its constituents and the raw material used to formulate the ration. Feed must supply all nutrients in adequate quantity and with high digestibility.

Sudan is currently the only Arab country that is self-sustainable in its feed production, with the exception of concentrates, premixes, some feed additives and toxin binders (Freiji, 2008).The nutrient requirements for poultry are affected by many factors including :

breed, age, sex, production stage, temperature , housing system, health status and purpose of production. Cereal grains are added primarily as a source of metabolizable energy while soybean, sesame and groundnut cakes represent the protein requirement. Feed additives used in poultry diets includes: mycotoxin binders, shell enhancers and some prebiotics or probiotics in order to improve health and growth (NRC,1994).Nutritionists have developed feeding standards for determining the daily nutritive requirements of poultry. There is difference, of course, between broiler diets and the diets of the laying hens. It is time to change this situation by making a new system to develop the concepts of poultry farming and feed manufacturing and establish technical and economical solutions by making manufacturing units produce well balanced rations to meet the nutrients requirements and update the standards and measurements of poultry feeds and their inputs if required .Therefore, the aim of this study was to obtain reliable data on chemical composition and nutritional value of poultry feeds available in the local markets in order to advise farmers for feed uses, and help feed millers to improve the quality of their products. Also the study aim to assist in updating of Sudanese specifications and standards which outlined by Sudanese Standard and Metrological Organization (SSMO).

Materials and Methods

Study site.

This study was carried out in Khartoum State, capital of Sudan. Broiler starter, broiler finisher and layer feeds samples were collected from six poultry feed factories during 2013 to evaluate the quality of compound feeds in Sudan.

Feed sampling protocol

The following protocol provides details of the feed sampling, which was developed following internationally accredited scientific guidelines for feed sampling (FAO, 2011).

Procedure for sample collection

Several increment (hand grab) samples were taken from the open bag and combined in a clean container. Once again, the quartering technique was used to reach the desired size of the composite sample. Because settling of feed is common, handfuls were taken from the lower and upper end of the sack. In some factories feed is packed in 50kg bags, therefore a probe was used in order to avoid damaging the bag.

The compound feeds selected for sampling include Broiler starter, broiler finisher and layer feeds. Therefore, in each production site, one sample of each compounded feed was collected. Upon collection, the samples were placed in a polyethylene press-seal bags, of a size so that they are almost completely filled by the sample; the air is then removed by squeezing and sealing tightly. Samples were accurately labelled with a unique code using a permanent marker pen immediately after collection. In a separate log book, specific details of the samples were recorded.

Chemical analysis

The feed samples were subjected to proximate analysis (crude protein [CP], ether extract (EE) and ash) as per the standard procedures of AOAC(1990) in triplicate.The analytical parameters measured were dry matter (DM%), crude protein (CP%), crude fat (fat%) crude fiber (CF%) Afatoxin (ppb) and total mineral content (% and/or mg/kg). Metabolizable energy (ME) (kcal.kg-1) was calculated according to the method described by Lodhi et al (1976). Aflatoxin determination was carried out by (ELIZA) technique and the total mineral content was measured by ICP Spectrometer.

Statistical analysis

Microsoft Excel (2013) was used to produce simple descriptive statistics with the data generated from the feeds chemical analysis. GenStat 17th Edition was used to analyse data relating to product quality.

Results and Discussion

Chemical composition of broiler starter feed

As seen in Table (3).CP content in all broiler starter feeds almost simillar to the recommended level (23%) stated by (NRC,1994 and SSMO,2015) except feed E recorded lower value (18.3%).Slightly higher ME content than the required levels were reported in feed A (3280.2Kcal/Kg) and feed F (3282.7 kcal/kg).On the contrary lower valve was recorded in feed E (2914 kcal/kg).Feed B (3197 kcal/kg),C (3176.1 kcal/kg), and D (3154.2 kcal/kg) satisfy ME requirement (3100 - 3202.6 kcal/kg) stated by (NRC, 1994 and SSMO 2015) this result may indicated that some factories may add fats in their feeds to stimulates feed and energy consumption at high ambient temperature (Fuller and Rendon,1977).Low levels of CF content were recorded in all feeds (3.7% feed F to 5.5% D feed) compared to the maximum recommended level (5%) mentioned by (NRC, 1994 and SSMO, 2015). Feed A, D and F reported higher fat content (7.5% 6.6% and 6.83%) lower values were recorded in feed B (4.2%), C (4.8%) and E (2.96%).The DM content of all feeds were within the acceptable ranges(93.18- 95.0%) stated by (NRC,1994 and SSMO, 2015),on the other hand, ash content ranges between (5.76% Feed C to 6.0% Feed B except feed E reported higher percent (14.6%) than the recommended level (8) stated by (SSMO 2015). High levels of aflatoxin (ppb) than the permitted level (20≤) were noticed in feed A (49.15) followed by C (35.63ppb) and D (35.31ppb), on the contrary too low levels of aflatoxin 5.7 ppb and 6.89 ppb were reported in B and F feeds. This variation might be due to the type and/or storage conditions of cakes used in these feeds.

As shown in table (4).The Ca% range between 0.83 feed C to 0.88 % feed A which is almost within the acceptable ranges stated by (NRC,1994 and SSMO 2015).On the contrary feed E recorded higher Ca content (3.4%) this might be due to laboratory error .Generally Zn and K content in all feeds were higher, meanwhile Fe, Mg and Na were lower, it has been known for some time that K requirement of growing chickens increased with increased temperature, therefore, dietary K levels should be increased for birds reared in heat stressed environment to maximize gain in weight of broiler (Huston,1978 and Teeter, 1987).

Chemical composition of broiler finisher feeds

As presented in table (5) Almost feed A, C, and E CP content fall within the acceptable ranges (18 -20%) recommended by (NRC,1994 and SSMO, 2015), meanwhile, feed B(23.16%), D (22.10%), and F (21.89%) recorded slightly higher CP than that outlined by both organizations, these variations may be due to the sources of protein used in these feeds (meat or cakes). ME (kcal/kg) in all feeds were met the recommendations of (NRC,1994 and SSMO,2015) except feed E which resulted in lower ME content (2747 Kcal/kg) this result based on the assumption that different factories may used different varieties of sorghum or add fats as a source of energy in their rations. The proximate analysis of feeds revealed that CF and Ash content in all feeds recorded lower values than the recommended levels stated by (NRC ,1994 and SSMO, 2015). Feed A(6.7 %), D (6.7%), E (5.6%) and F (6.6%) had slightly higher fat content than the required range (2-5%) stated by (SSMO 2015) ,mean while feed B (3.5%) and

C (4.6%) had acceptable fat content, . DM% in all feeds were within the ranges (90-95%) stated by (NRC,1994 and SSMO,2015).
Feed A ,B ,C and D reported higher aflatoxin content than the permitted level (20 ppb) (NRC1994 and SSMO 2015).On the contrary feed E and F recorded lower values (19.0 and 10.32 ppb),This result reflect the quality of raw materials (Cakes and cereals) and their storage condition.

Higher levels of K (0.49 – 0.6%), Na (0.14-0.21%), Mn (107.5 -141.7 mg/kg) and Zn (73.86 – 105.5 mg/kg) were recorded in all broiler finisher feeds except B and C feeds showed lower values of Zn (0.22 mg/kg and 0.49 mg/kg %) than the recommended levels stated by (NRC,1994 and SSMO, 2015).On the other hand, feed D recorded acceptable level of Na (0.12%).On the contrary low levels of Fe (14.12 - 45.33 mg/kg) and Mg(136 - 233 mg/kg) were noticed in all feeds except feed F showed an acceptable level of Fe (80.03mg/kg).Ca contents almost satisfy the requirements (0.83 to 0.91%) except D and E feeds contained very low levels of Ca (0.24% and 0.49%).

Chemical composition of layer feed

The proximate composition of all layer feeds has been presented in Table (1).The CF%, Fat%, DM% and aflatoxin (ppb) in all feeds were within the acceptable ranges stated by NRC (1994) and SSMO (2015), (2.9- 4.5%, 94.31- 94.79% and 7.6- 18.3 ppb respectively) this suggests that all feeds analyzed are appropriate, low level of aflatoxin reflected the quality and storage conditions of raw materials used in formulating these feeds, or may be due to the fact that high DM contents control the growth of mould in feeds, thereby reducing deterioration of feeds (Kaijage et al., 2014).Higher CP content thant the required levels were observed in feed D (20.98%). On the other hand, all other feeds CP% A (17.9), B (18.6), C (18.0) and E (17.86) almost within the recommended ranges of (NRC,1994 and SSMO,2015).These differences may be due to the type of agro-industrial by-products used in thes feeds.The metabolizable energy (Kcal/Kg) content varied between low 2679 Kcal/Kg (feed D) to very high 3127.9 Kcal /Kg (feed B) than the required levels recorded by (NRC,1994and SSMO,2015) these variations could be due to the differences in ingredients used as sources of energy in these feeds and/or the rate of inclusions of these ingredients different factories my formulate their rations according to the nutrient requirements of each production stage, hybrid strain or season of production (Leeson and Summer, 2001).High levels of ash above the recommendations of NRC (1994) and SSMO (2015) were recorded in all layer feeds (10.33 to 20.85%) this result may indicate a high mineral content but it was not, so it may be due to the presence of undesirable materials (RAO and Xiang, 2009).
The results of mineral content of layer feeds showed that the Ca (3.0 -3.5%), Mg (150 – 210 mg/kg), Mn (11.6 - 13.74 mg/kg) and Na (0.05 – 0.18 %) content are generally low in all feeds. On the contrary K (0.52 – 0.6 %) and Zn (5555.26- 92.45%) are high than the required recommendations of NRC (1994) and SSMO (2015).On the other hand, Fe content of feed D (62.4mg/kg) and feed E (69.1mg/kg) slightly higher than the required level (60mg/kg) except feed A, B and C feeds showed low values (50.34mg/kg , 24.5mg/kg and 41.4mg/kg).These variations in mineral contents of feeds might be attributed to dietary mineral contents and/or sources or feed additives used in feeds. On the other hand, some factories have followed the practice of adjusting the dietary levels of minerals in order to maintain a constant intake of these nutrients as temperature and thus feed intake levels vary.

Conclusions and recommendation

-The evaluation of broiler and layer feeds revealed an acceptable result of proximate analysis included justified variations.

- Most of the diets nutrients content agreed with NRC (1994) and to some extend with SSMO(2015) except in minerals and aflatoxin content of broiler feeds.

- It is high time to update specifications of layer feeds by SSMO according to the production stage (period) and/or HD% egg production.

- The variations observed among different poultry feeds compared to (NRC1994) and (SSMO 2015) specifications strongly indicates that confirmatory analyses should be conducted.

- NIR technique for quick feed analysis shall be introduced.

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Table (1) Chemical composition of layer diets

Treatments / Parameters	Means ±SE						
	A	**B**	**C**	**D**	**E**	**NRC (1994)**	**SSMO (2015)**
CP%	17.90^{b}±0.08	18.6^{b}±0.06	18.0^{b}±0.08	20.98^{a}±0.19	17.86^{b}±0.18	18.8	16-17
*ME(kcal/kg)	2916.4^{c}±3.7	3127.9^{a}±2.5	2912.4^{c}±3.4	2679.2^{e}±2.02	2954.4^{b}±14.7	2900	2749-2800
CF%	4.5^{a}±0.03	3.8^{b}±0.05	4.4^{a}±0.07	3.7^{b}±0.03	3.5^{b}±0.2	≥5	≥5
Fat%	3.2^{b}±0.15	4.5^{a}±0.011	3.5^{b}±0.05	3.4^{b}±0.009	2.9^{c}±0.04	NA	(2-5)
DM%	94.9±0.05	94.9±0.05	94.79±0.09	94.31±0.02	94.46±0.15	90	(90-95)
Ash%	13.43^{b}±0.03	10.33^{c}±0.04	14.83^{b}±0.07	20.85^{a}±0.015	14.06^{b}±0.18	NA	8
Aflatoxcin (ppb)	12.6^{b}±0.4	18.3^{a}±0.02	7.6^{d}±0.1	11.64^{b}±0.05	8.45^{c}±0.19	≤ 20	≤ 20

*ME was calculated according to the equation of Lodhi et al (1976)

Table (2) Minerals content of layer diets

Treatments / Parameters	Means ±SE						
	A	**B**	**C**	**D**	**E**	**NRC (1994)**	**SSMO (2015)**
Ca%	3.1^{b}±0.06	3.07^{c}±0.04	3.4^{a}±0.11	3.0^{b}±0.09	3.5^{a}±0.09	4.06	4.2
Fe(mg/kg)	50.34^{c}±0.08	24.5^{e}±0.2	41.4^{d}±0.28	62.4^{b}±0.26	69.1^{a}±0.06	56	60
Mg(mg/kg)	216.7^{c}±12	150^{d}±5.8	246.7^{a}±3.3	210^{c}±5.8	226.7^{b}±8.8	675	NA
Mn (mg/kg)	12.7^{a}±0.024	11.6^{b}±0.029	13.3^{a}±0.052	11.82^{b}±0.028	13.74^{a}±0.027	25	30
Na%	0.12^{b}±0.003	0.05^{d}±0.006	0.12^{b}±0.003	0.11^{c}±0.003	0.19^{a}±0.006	0.19	NA
K%	0.55^{a}±0.01	0.53^{a}±0.02	0.53^{a}±0.009	0.52^{a}±0.006	0.49^{b}±0.003	0.19	NA
Zn%	92.45^{a}±0.23	55.26^{d}±0.17	79.64^{c}±0.22	90.56^{a}±0.1	85.41^{b}±0.11	44	35

Table (3) Chemical composition of broiler starter diets

Treatments / Parameters	Means ±SE							
	A	**B**	**C**	**D**	**E**	**F**	**NRC (1994)**	**SSMO (2015)**
CP%	23.92^{a}±0.04	23.0^{a}±0.02	23.05^{a}±0.01	23.48^{a}±0.18	18.3^{b}±0.2	23.32^{a}±0.04	23	23
*ME(Ekcal/kg)	3280.2^{a}±2.5	3197^{b}±2.1	3176.1^{c}±2	3154.2^{d}±1.1	2914^{e}±8.6	3282.7^{a}±6.5	3100	3202.6
CF%	4.24^{c}±0.06	4.49^{b}±0.01	4.32^{b}±0.03	5.5^{a}±0.1	4.4^{b}±0.1	3.7^{d}±0.1	≥5	5
Fat%	7.5^{a}±0.006	4.2^{d}±0.14	4.8^{d}±0.04	6.60^{c}±0.03	2.96^{e}±0.006	6.83^{b}±0.006	NA	(2-5)
DM%	94.52±0.16	94.98±0.02	93.18±0.05	94.78±0.01	95±0.01	94.1±0.1	90	(90-95)
Ash%	5.99^{c}±0.01	6.0^{c}±0.03	5.76^{c}±0.03	7.05^{b}±0.10	14.60^{a}±0.14	5.9^{c}±0.02	NA	8
Aflatoxin(ppb)	49.15^{a}±0.15	5.7^{e}±0.08	35.63^{b}±0.07	35.31^{b}±0.12	6.89^{d}±0.006	14.4^{c}±0.15	≤20	≤20

*ME was calculated according to the equation of Lodhi et al (1976)

Table (4). Mineral content of broiler starter diets

Treatments / Parameters	Means ±SE							
	A	**B**	**C**	**D**	**E**	**F**	**NRC (1994)**	**SSMO (2015)**
Ca%	0.88^{a}±0.01	0.84^{b}±0.008	0.83^{a}±0.006	0.84^{b}±0.003	3.4^{c}±0.09	0.85^{a}±0.006	0.9-1	1
Fe (mg/kg)	50.5^{b}±0.15	28.23^{d}±0.28	51.3^{b}±0.09	50.8^{b}±0.15	35.2^{c}±0.15	65.27^{a}±0.18	80	80
Mg (mg/kg)	230^{b}±5.77	176.7^{c}±3.33	216.7^{b}±3.33	220^{b}±5.77	260^{a}±5.77	253.3^{a}±3.33	600	NA
Mn(mg/kg)	108.67^{d}±0.88	75.83^{f}±0.18	150.3^{b}±0.33	99.29^{e}±0.07	141.1^{c}±0.59	167.67^{a}±0.67	60	60
Na%	0.13^{b}±0.003	0.09^{c}±0.003	0.20^{a}±0.003	0.13^{b}±0.003	0.12^{b}±0.06	0.14^{b}±0.003	0.2	NA
K%	0.56^{b}±0.003	0.57^{b}±0.003	0.60^{a}±0.006	0.60^{a}±0.007	0.53^{c}±0.003	0.60^{a}±0.12	0.3	NA
Zn%	70.9^{c}±0.06	21.8^{f}±0.03	33.63^{e}±0.09	73.9^{c}±0.03	85.42^{b}±0.02	91.45^{a}±0.06	40	40

Table (5). Chemical composition of broiler finisher diets

Treatments / Parameters	Means ±SE							
	A	**B**	**C**	**D**	**E**	**F**	**NRC (1994)**	**SSMO (2015)**
Crude protein(CP%)	20.0^{c}±0.11	23.16^{a}±0.04	20.30^{c}±0.10	22.10^{b}±0.03	20.20^{c}±0.10	21.89^{b}±0.02	18	20
*ME(Ekcal/kg)	3349.21^{a}±3.5	3189.3^{e}±5.4	3206^{c}±7.3	3274.9^{d}±3.9	2747.2^{f}±4.1	3310.5^{b}±2	3200	3926
Crude fiber (CF%)	3.6^{c}±3.5	3.4^{c}±0.13	4.2^{a}±0.13	4.0^{b}±0.10	4.0^{b}±0.10	3.4^{c}±0.04	≥5	5
Fat %	6.7^{a}±0.01	3.5^{c}±0.02	4.7^{b}±0.03	6.7^{a}±0.07	4.6^{b}±0.11	6.6^{a}±0.02	NA	(2-5)
Dry matter(DM%)	94.48^{a}±0.03	94.05^{b}±0.02	93.46^{c}±0.03	94.04^{b}±0.06	94.23^{d}±0.08	94.31^{d}±0.05	90	90-95
Ash%	5.1^{b}±0.03	5.96^{a}±0.003	5.85^{a}±0.01	5.79^{a}±0.01	2.62^{c}±0.17	5.8^{a}±0.003	NA	8
Aflatoxin (ppb)	24.71^{d}±0.03	27.22^{b}±0.01	43.59^{a}±0.04	26.42^{c}±0.05	19.0^{e}±0.01	10.32^{f}±0.01	≤20	≤20

*ME was calculated according to the eguation of Lodhi et al (1976)

Table (6).Mineral content of broiler finisher diets

Treatments / Parameters	Means ±SE							
	A	**B**	**C**	**D**	**E**	**F**	**NRC (1994)**	**SSMO (2015)**
Ca%	0.9^{a}±0.004	0.91^{a}±0.006	0.83^{b}±0.003	0.24^{d}±0.004	0.49^{c}±0.007	0.90^{a}±0.003	0.8	1
Fe(mg/kg)	23.6^{e} ±0.02	45.33^{b}±0.01	42.59^{c}±0.05	14.12^{f}±0.04	40.5^{d}±0.03	80.03^{a}±0.03	60	80
Mg (mg/kg)	143.3^{e}±3.3	206.7^{c}±3.3	216^{b}±3.3	136^{f}±3.3	150^{d}±5.77	233^{a}±3.3	600	A
Mn (mg/kg)	107.5^{e}±0.5	110.5^{d}±0.6	141.7^{a}±0.52	141.3^{a}±0.58	116.3^{c}±0.58	135^{b}±1.0	60	60
Na%	0.16^{b}±0.006	0.14^{c}±0.006	0.21^{a}±0.006	0.12^{d}±0.006	0.15^{c}±0.01	0.16^{b}±0.01	0.12	NA
K%	0.57^{b}±0.003	0.60^{a} ±0.006	0.52^{c}±0.003	0.60^{a}±0.006	0.49^{d}±0.006	0.54^{b}±0.006	0.3	NA
Zn (mg/kg)	62.6^{d}±0.06	24.87b±0.3	35.3^{e}±0.1	101.2^{b}±0.2	73.86^{c}±0.1	105.5^{a}±0.2	40	40

تقييم نوعية أعلاف الدواجن بولاية الخرطو – السودان

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المستخلص

أجريت هذة الدراسة لتقييم نوعية وجودة أعلاف الدواجن التي تباع لمزارع الدواجن ومقارنتها مع الاحتياجات الغذائية المدونة بواسطة المجلس القومي للبحوث (994) والهيئة السودانية للمواصفات والمقايس (015) تم إجراء التحليل الكيميائي بواسطة AOAC (1990) لعدد 17 عينة علف (لاحم بادي، 6 لاحم ناهي و 5 عينات علف بياض) جمعت عشوائياً من ستة مصانع لإنتاج إعلاف الدواجن وذلك في العام 2013 .تم حساب نسبة المادة الجاف، البروتين الخام، الدهون، الالياف الخام، الرماد بالاضافة لمحتوي الاعلاف من السموم (جزء في البليور)، إما الطاقة الممثلة (كيلوكالوري/كجم) تم حسابها بإستخدام معادلة Lodhi(1976) .كما تم حساب محتوي الاعلاف من الاملاح الرئيسية الكالسيوم، الزنك، البوتاسيوم والصوديوم بالاضافة للاملاح النادرة الحديد، الماغنيزم والمنجنيز. أوضحت نتائج التحليل الكيميائي لأعا ف اللاحم البادي والناهي أن محتوها من البروتين في معظم الاعلاف ضمن الحدود المسجلة بواسطة المجلس القومي للبحوث والهيئة السودانية للمواصفات والمقايس (23%) عدا علف البادي E والذي سجل نسبة أقل من البروتين (18.3%) وكذا أعلاف الناهي 3 ، و F سجلت نسبة بروتين أعلي (23.16، 22.10 و 21.89 % علي التوالي).إن محتوي أعلاف البادي من الطاقة الممثلة تراوحت بين 2914 Kcal/Kg علف E الي 3282 Kcal/Kg علف بينما يترواح محتواها في أعلاف الناهي بين 2747 Kcal/Kg علف الي 3349 Kcal/Kg علف A من التحليل يتضح أن معظم أ لاف اللاحم البادي والناهي بها محتوي كافي من الطاقة الممثلة عدا علف والذي أظهر محتوي منخض من الطاقة الممثلة.إن متوسط نسبة الالياف الخام في جميع اعلاف البادي و الناهي كان أقل من الحد المسموح به (3.5 الي 5 %) ونسبة المادة الجافة بين(0 الي 5 %) هي تماثل المدي المسجل بواسطة المجلس القومي للبحوث والهيئة السودانية للمواصفات والمقايس.ان محتوي اعلاف البادي والناهي A، D، من الدهون كان أعلي مقارنة بالاحتياجات الغذائية (5%-) حيث تراوحت بين(6.6 الي 5. %) واقل في B,C,E (2.69 الي 8. %) كما أوضحت نتائج التحليل الكيميائي إنخفاض نسبة الرماد في جميع أعلاف البادي والناهي مقارنة بالمحتوي القياسي (%) ماعدا العلف E والذي أظهر نسبة عالية جدا من الرماد (4.6 %)كما تلاحظ وجود نسبة عالية من السموم عن الحد الاقصي المسموح به (20 ppb)في كل من أعلاف لبادي A ,C, (9.15، 35.63 و 35.31) والناهي C,B (27.22 و 43.59 pb). أما نتائج التحليل الكيميائي لأعلاف البياض فقد أظهرت أن محتواها من البروتين الخام بين تراوح 7.86 الي 8.6 % بإستثناء علف D والذي كان محتواه من البروتين أعلي من الاحتياج المطلوب (17 – 8 %) ومن ناحية أخري فإن محتوي أعلاف البياض من الطاقة الممثلة تراوح بين 2679.2 الي 3127.9 كيلوكالوري/كجم بينما الاحتياجات الغذائية من الطاقة الممثلة تتراوح بين 2900 الي 2749 كيلوكالوري/كجم.ومن ناحية اخر فإن نسبة الدهون والمادة الجافة كانت في كل الاعلاف كانت ضمن الحدود المقترحة بواسطة المجلس القومي للبحوث والهيئة السودانية للمواصفات والمقايس (5%-2) و (95% – 90) .وبصورة عامة فإن كل الاعلاف أحتوت علي نسبة

عالية من الرماد(-%20.85 10.33) مقارنة ب (8%) كحد أقصي مسموح بة.بالاضافة لذلك فإن كل الاعلاف حتوت علي نسبة من الالياف الخام (3.5 – 5. %) والسموم (7.6 –18.3 pb،) أقل من الحدود القصوي المسموح بها. إن محتوي أعلاف البادي من الحديد، الماغنيزيم والصوديوم كان منخفضاً بالمقارنة مع الاحتياجات المطلوبه من تلك العناصر المعدنية (0؛ ملجم/كجم، 00، ملجم/كجم و0؛ % علي التوالي) بينما إرتفع محتواها من البوتاسيوم ، المنجنيز والزنك ماعدا 3 و C أظهرتا معدل من الزنك (21.3 و 3.63 %).لقد لوحظ ايضاً ان محتوي تلك الاعلاف من الكالسيوم تراوح بين 0.83 و 88.، % وهو منخفض قليلاً عن الاحتياجات المطلوب توفرها عدا علف 3 والذي اظهر محتوي عالي جداً من الكالسيوم (5.، %).أما اعلاف الناهي فقد سجلت نسبة عالية من البوتاسيوم ، الصوديوم ، المنجنيز والزنك مع إستثناء B وC كان محتواهما من الزنك منخفض (0.22 و 49.، %) بالاضافة لذلك فإن كل الاعلاف احتوت علي نسب متدنية من الحديد والماغنيزيم ع إستثناء علف والذي احتوي علي المعدل المحدد تقريباً (80.03 ملجم /كجم).إن محتوي الكالسيوم في جميع الاعلاف (0.83 –91.، %) كان مطابقاً تقريبا لنسبة الكالسيوم المطلوب توفرها في اعلاف الناهي ولكن علف D و E كان محتواهما من الكالسيوم منخفضاً (0.24 و 49. %). عموماً كل اعلاف البياض أظهرت محتوي منخفض من الكالسيوم ، الحديد، الماغيزيوم ، المنجنيز والصوديوم مقارنةً بالمعدل المطلوب عدا علف D و 3 محتواهما من الحديد مرتفع (62.4 و 69.1 ملجم/كجم) بالاضافة لإرتفاع نسبة البوتاسيوم والزنك ايضاً(0.49 – 55. %) و (55.26 – 2.45، %). نتيجة للتباين في التركيب الكيميائي لأعلاف الدواجن المختلفة مقارنة بالاحتياجات القياسية المحددة بواسطة المجلس القومي للبحوث والهيئة السودتمية للمواصفات توصي الدراسة بإجراء تحاليل تأكيدية علي فترات لضبط جودة الاعلاف.